Suggested Monitoring and Verification Methods for Tracking Potential Water Savings

Applicants are encouraged to propose alternative monitoring and verification methods which may be preferable to those identified below. Reclamation understands that baseline information may not be available and that other estimation methods will need to be employed in some cases. For these cases and alternative verification methods, please provide supporting information to substantiate the efficacy of proposed measures.

Water Banks and Water Markets

A. Water Marketing (Transfers)

Water Marketing is the temporary or long-term transfer of water or the right to use it from one user to another by purchase, lease or other form of exchange. Water Marketing is a mechanism to move water supplies to areas of greatest need and can be a short- or long-term mechanism to increase the beneficial use of existing water supplies.

Suggested monitoring and/ or verification methods for tracking water marketing performance include the following:

- Track diversions before and after project implementation for both the buyer and seller of the marketed water
- Compare pre-water market stream water quality measurements with measurements during the water market period. This may include pre/post changes in water temperature during critical months, pathogens, bacteria count, etc.
- Compare pre-water market stream flow measurements with stream flow measurements during the water market period.
- Compare pre- and post water market effects in terms of the length of the irrigation season. Determine whether or not water marketing helped districts extend their season.
- Measure the benefits resulting from the application of the transferred water. For example, state how many acres were irrigated that could not otherwise have been irrigated or whether the transfer had environmental benefits, such as providing flows for endangered fish or aquatic species, urban and industrial use or maintaining wetland areas.

B. Groundwater Banking

Some districts are implementing programs regarding ground water banking to control water quality and quantity. Program elements may address:

1. Active assessment of water supply and quality.
2. Adopt rules regulating ground water withdrawals by means of spacing and production limits.
3. Creation or expansion of recharge and/or capabilities.

Suggested monitoring and/ or verification methods for tracking groundwater banking performance include the following:

- Measure and record pre- and post-project recharge and/or pumping volumes (amount, duration and timing) into a central database.
- Measure and record pre- and post-project changes (amount, duration and timing) in affected stream flows or changes in spring discharge related to ground water banking.
- Establish a baseline based on historical data from existing wells, such as pumping volumes and depth to ground water elevations.

New Technologies for Improved Water Management

A. System Management

• Proposals may deal with SCADA systems that monitor flows in a district or river basin which may involve several districts. These systems acquire data and allow the water master or system operator to make diversion decisions based on real time information and can reduce the volume of excess water needed to insure adequate deliveries. Thus, the water master or system operator can better utilize water. These types of systems achieve some of the Water 2025 goals of reduced conflict and better water management.

Suggested monitoring and/ or verification methods for tracking system management performance include the following:

- Calculate amount of increased carryover storage in associated reservoirs.
- Track and record the diversions to individual districts and ditch companies of district laterals and compare to pre-project diversions. This would show results of improved management.

B. Spillage Reduction

• Projects aimed at spillage reduction from canals should focus on prevention and capture/reuse. Prevention requires improvements to the distribution and management of delivery systems such as system automation. Interception requires directing the spillage to drains or canals for reuse.

Measurement of potential savings:

To calculate potential savings, the following formula can be applied:

Estimated savings = $(\text{Spillage})_{\text{w/o project}} - (\text{Spillage})_{\text{w/project}}$

Suggested monitoring and/ or verification methods for tracking spillage reduction performance include the following:

- ***Establish baseline spillage data if not already available.***
- Measure flows with rated devices pre- and post-project to account for temporal variations. Calculate water savings by using above formula.
- Track changes in the number and/or the amount of diversions before and after project implementation.

C. Drainage Reuse

Several types of projects can focus on drainage and reuse including:

1. Pump stations with constant flow rates
2. Variable speed pump stations without SCADA controls
3. Variable pump stations with SCADA controls
4. Storage reservoirs with pump stations and constant flow rates
5. Storage reservoirs with variable speed pump stations and SCADA controls

Measurement of potential savings:

To calculate potential savings, the following formula can be applied:
Estimated Savings = (Drainage $_{w/o\ project}$-Drainage $_{w/project}$) + (Spillage $_{w/o\ project}$-Spillage $_{w/project}$)
A rated measuring device must be positioned to measure drain water losses. A one year history of pre-project measurements is optimal for future comparison to post-project water usage.

Suggested monitoring and/ or verification methods for tracking drainage reuse performance include the following:

- Take readings from measuring device positioned to measure drain water loss. As well, one needs to consider spillage that may be caused by water re-introduction. A system analysis can be done with the following equation: Drainage $_{w/project}$ = (1-%Reuse)*Drainage $_{w/o\ project}$
- Measure and record water deliveries to field, tailwater volumes entering reservoirs and tailwater volumes recycled to fields. Compare reductions in post-project to previous history.

D. ET Controllers

The installation of ET controllers will improve landscape water applications by considering the weather and plant needs.

Measurement of potential savings:

To calculate potential savings, the following formula can be applied:
Estimated Savings = N [(Average amount of landscape water applied per participant) $_{w/o\ ET\ Controller}$ – (Average amount of landscape water applied per participant) $_{w/\ ET\ Controller}$]
N = number of participants

Domestic water usage:

If domestic water is not metered, domestic water can be estimated based on the number of persons in the household and type of plumbing (low-flow or not).
Domestic usage can also be estimated using the assumption that landscape water is negligible during certain parts of the year, and therefore,
Domestic Usage = (Average Use) $_{determined\ non\text{-}irrigation\ season}$

Once the domestic usage value is obtained, landscape water applied can be calculated using the following formula:
(Landscape water applied) $_{w/o\ ET\ Controllers}$ = Total water use - Domestic Water

Suggested monitoring and/ or verification methods for tracking ET Controller performance include the following:

- Compare meter readings from prior to ET controller installation and post-installation.
- Compare actual water applied to calculated water needs based on local weather station data.
- Compare actual water applied to estimated water application if only using sprinkler controller on a set timer application.

E. Irrigation Improvements

On farm system improvements may include:

1. Converting to more efficient irrigation systems
2. Upgrading current systems
3. Improving irrigation scheduling or management

Measurement of potential savings:

To calculate potential savings, the following formula can be applied:

Estimated Savings = $(\text{On-farm delivery})_{\text{w/o project}}$ - $(\text{On-farm delivery})_{\text{w/ project}}$

Suggested monitoring and/ or verification methods for tracking on-farm improvements performance include the following:

- Monitor delivery to project fields and calculate water savings using delivery records and formula above.
- Measure pre- and post-project changes in power use resulting from system improvements, increased efficiencies and/or changes in irrigation scheduling.
- Compare volume of water applied with the volume and quality of surface runoff generated to historical data.

Canal Lining or Piping

Canal lining or piping projects are introduced to decrease canal seepage.

Measurement of potential savings:

- To calculate potential savings, the seepage coefficient (K), the canal wetted area (A) and the days of seepage opportunity need consideration. The following formulas can be applied:

Estimated volume of seepage in $ft^3 = K*A*T$

Estimated savings $= (K*A*T)_{w/o\ project} - (K*A*T)_{w/project}$

- Ponding tests of canal reaches: Conduct ponding tests along canal reaches purposed for lining or piping.
- In flow/Out flow testing: Measure water flowing in and out of the purposed canal reach, taking evaporation into consideration.

Suggested monitoring and/ or verification methods for tracking canal lining or piping performance include the following:

- Ponding tests of canal reaches: Conduct ponding tests along canal reaches lined or piped. Use pre- and post-project ponding tests to calculate water savings.
- In flow/Out flow testing: Measure water flowing in and out of the lined or piped canal reach, taking evaporation into consideration. Use pre- and post-project tests to calculate water savings.
- Benefits can be calculated by using historic seepage and evaporation rates for the lateral length. Results can be verified using a ratio of historic diversion-delivery rates. Also include a comparison of historical canal efficiencies and current canal efficiencies.
- Record reduction in water purchases by shareholders and compare to historical water purchases.
- Take measurements of surface water flows and groundwater elevations and compare to historical values.

Measuring Devices

Installation of measuring devices may include the following:

1. Flow meters
2. Weirs
3. Flumes
4. Meter gates

Measurement of potential savings:

Pre-project estimated savings are difficult to measure; however, one can collect historical data on water use and record data into a database.

Suggested monitoring and/ or verification methods for tracking measuring device performance include the following:

- Use estimates based on published reports and accepted practices.
- Track results using measuring device information and compare to historical water uses.